

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

POLAROID CORPORATION,

Plaintiff and Counterclaim Defendant,

v.

HEWLETT-PACKARD COMPANY,

Defendant and Counterclaim Plaintiff.

C.A. No. 06-738-SLR

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AFFIDAVIT OF DR. ROBERT L. STEVENSON

I, Robert L. Stevenson, affirm and declare as follows:

1. I have been retained by counsel for Hewlett-Packard Company ("HP") to serve as a technical expert witness.

2. On April 18, 2008, I submitted an Expert Report on non-infringement of U.S. Patent No. 4,829,381 (the "381 patent"). This declaration summarizes certain statements and opinions set forth in my expert report.

3. I have a Bachelors degree in Electrical Engineering from the University of Delaware and a Ph.D. degree in Electrical Engineering from Purdue University. My Ph.D. research was in the area of communications and signal processing.

4. I am presently a Professor in the Department of Electrical Engineering and in the Department of Computer Science and Engineering at the University of Notre Dame. I first joined the faculty at the University of Notre Dame as an Assistant Professor in the Department of Electrical Engineering in 1990. I was granted tenure and promoted to the rank of Associate Professor in August 1996. I attained the rank of Professor in the Department of Electrical Engineering in August 2002, and I continue to serve in that

capacity. I have served concurrently as a Professor in the Department of Computer Science and Engineering at the University of Notre Dame since January 2003.

5. I spent the summer of 1992 at the Air Force Research Lab in Rome, New York and I spent the summer of 1993 at the Intel[®] Corporation in Hillsboro, Oregon. Several leading computing companies, including Intel[®], Sun Microsystems[®], Apple[®] Computer, and Microsoft[®], have supported my research at Notre Dame. During the past 20 years, I have published over 100 technical papers related to the field of image processing and digital systems.

6. I am a member of the Institute of Electronics and Electrical Engineers, The International Society for Optical Engineering, and the Society for Imaging Science and Technology. I am a member of the academic honor societies Eta Kappa Nu, Tau Beta Pi, and Phi Kappa Phi.

7. For the past 20 years my work has focused on the design of techniques, hardware, and software for the processing of digital signals using digital computing devices. As an academic researcher I attempt to develop novel ideas for systems, then publish and present those ideas to the technical community. My success as an academic is directly related to the insights and techniques which provide the basis for new generations of products. My early work on digital techniques for printing and image capture devices led to significant interaction with companies developing desktop computers products in the early 1990's as they tried to incorporate those ideas into their products.

8. My interaction with Apple's Imaging Group focused on various imaging devices such as digital cameras, scanners, and printers and how to best support those

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devices on desktop computers. Similarly, my interaction with Sun Microsystem's group examined how advanced signal processing techniques could be best implemented using Sun's new Visual Instruction Set on the SPARC architecture.

9. I have also received significant support for my research from several U.S. Department of Defense Agencies. The Air Force Research Laboratory has funded my work to develop advanced parallel processing algorithms which exploited an ad-hoc network of mixed computers to achieve significant computational advantages over their previously implemented techniques. Other Department of Defense agencies have supported my work in image and video enhancement.

10. I have published 27 journal articles, written six book chapters, edited the proceedings of eight SPIE conferences and one other conference, presented 73 papers at professional conferences, and presented five papers at undergraduate research conferences.

11. Additional information concerning my background, qualifications, publications, conferences, honors, and awards are described in my Curriculum Vitae, a copy of which is attached hereto as **Exhibit A.**

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CERTIFICATE OF SERVICE

I hereby certify that on June 5, 2008, I electronically filed with the Clerk of Court the foregoing document using CM/ECF which will send electronic notification of such filing(s) to the following counsel:

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/s/ Raymond N. Scott, Jr.

Raymond N. Scott, Jr.

Exhibit A

CURRICULUM VITAE

Robert Louis Stevenson

Professor

Department of Electrical Engineering

University of Notre Dame

Notre Dame, Indiana 46556

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Internet – Stevenson.1@nd.edu

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Personal Data

Born: December 20, 1963; Ridley Park, Pennsylvania

Citizenship: United States

Married: Donna Geralyn Stevenson

Educational Background

Purdue University 1986–1990

Degree: Ph.D., August 1990

Area: Communications and Signal Processing

GPA: 6.0/6.0

Thesis Advisor: Professor Edward J. Delp

Thesis Research: Invariant Reconstruction of Curves and Surfaces with Discontinuities
with Applications in Computer Vision

Honors: National Science Foundation Graduate Fellowship, 1986–1989

DuPont Graduate Fellowship in Electrical Engineering, 1986–1990

Phi Kappa Phi Graduate Fellowship, 1986

Purdue University Graduate Instructor Fellowship, 1986

University of Delaware 1982–1986

Degree: B.E.E. with Distinction and Summa Cum Laude, June 1986

GPA: 4.0/4.0

Thesis Advisor: Professor Gonzalo R. Arce

Thesis Research: On the Theoretical Properties of Morphological Filters

Honors: Valedictorian, 1986

IEEE Delaware Bay Section Engineering Award, 1986

Elected into Phi Kappa Phi Academic Honor Society, 1985

Elected into Tau Beta Pi Engineering Honor Society, 1985

Elected into Eta Kappa Nu Electrical Eng. Honor Society, 1985

Liston A. Houston Scholarship, 1985

Sharp Scholarship, 1985–1986

Engineering Scholar, 1984

Tau Beta Pi Prize, 1983

Professional Experience

Professor, Department of Computer Science and Engineering, University of Notre Dame, Notre Dame, Indiana, January 2003 – Present.

Professor, Department of Electrical Engineering, University of Notre Dame, Notre Dame, Indiana, August 2002 – Present.

Associate Professor, Department of Electrical Engineering, University of Notre Dame, Notre Dame, Indiana, August 1996 – August 2002.

Visiting Associate Professor, Department of Electrical Engineering, University of Delaware, Newark, Delaware, September 1996 – June 1997.

Assistant Professor, Department of Electrical Engineering, University of Notre Dame, Notre Dame, Indiana, August 1990 – August 1996.

Research Associate, Intel Corp., Hillsboro, Oregon, June 27, 1994 – August 26, 1994.

Research Associate, Air Force Office of Scientific Research, Rome Laboratories, Griffiss Air Force Base, Rome, New York, May 24, 1993 – July 30, 1993.

Graduate Research Assistant, School of Electrical Engineering, Purdue University, West Lafayette, Indiana, August 1989 – August 1990.

Graduate Teaching Instructor, School of Electrical Engineering, Purdue University, West Lafayette, Indiana, August 1986 – May 1987.

Intern, Engineering Physics Laboratory, E. I. duPont de Nemours & Company, Wilmington, Delaware, June 1986 – August 1986.

Intern, Corporate Technology Center, Sperry Corporation, Reston, Virginia, June 1985 – August 1985.

Professional Honors and Awards

Department of Electrical Engineering Outstanding Teacher Award, 1993

Professional Activities

Associate Editor,

Journal of Electronic Imaging, 2007–Present

Journal of Electronic Imaging, 1995–1998.

IEEE Trans. on Circuits and Systems for Video Technology, June 1997–Dec. 2002.

IEEE Trans. on Image Processing, June 1999–May 2003.

Special Issue Editor,

Multimedia Systems, *Journal of Electronic Imaging*, April 1996.

Still Image Compression, *SPIE's Electronic Imaging Newsletter*, January 1996.

Best Paper Award Board Membership,

IEEE Trans. on Circuits and Systems for Video Technology, 2002.

Symposium Chairman,

SPIE/IS&T Symposium on Electronic Imaging, 2004.

Conference Chairman,

SPIE/IS&T Conf. on Computational Imaging, Feb. 2003,
SPIE/IS&T Conf. on Image and Video Communications and Proc., Feb. 2000,
SPIE/IS&T Conf. on Visual Communications and Image Processing, Feb. 1999,
41st Midwest Symposium on Circuits and Systems, Aug. 1998,
SPIE Conf. on Electronic Imaging and Signal Processing, Nov. 1996,
SPIE/IS&T Conf. on Still Image Compression II, Feb. 1996,
SPIE/IS&T Conf. on Image and Video Processing IV, Feb. 1996,
SPIE/IS&T Conf. on Image and Video Processing III, Feb. 1995,
SPIE/IS&T Conf. on Image and Video Processing II, Feb. 1994.

Steering Committee Member,

Midwest Symposium on Circuits and Systems, 1994 – Present,
Electronic Imaging, 2003 – 2005

Organizing Committee Member,

Nonlinear Signal and Image Processing Workshop, 2001.

Technical Program Committee,

International Conference on Image Processing, 1998 – Present
SPIE Computational Imaging, 2003–Present,
Visual Communications and Image Processing, 1997–Present,
Image and Video Communications and Processing III, 2005,
Computational Imaging, 2004,
International Conference on Pattern Recognition, 2000
International Conference on Acoustics, Speech, and Signal Processing, 2000
International Symposium on Circuits and Systems, 1998, 2005
9th IEEE Image and Multi. Signal Processing Workshop, Mar. 1996,
Midwest Symposium on Circuits and Systems, August 1994.

Member of IEEE, SPIE, IS&T, Eta Kappa Nu, Tau Beta Pi and Phi Kappa Phi.

Panel Member for the following funding agencies

National Science Foundation

Reviewer for the following funding agencies

National Science Foundation

Israel Science Foundation

Hong Kong Research Grants Council

Kentucky EPSCoR Program

North Dakota EPSCoR Program

Louisiana Board of Regents

Reviewer for the following archival journals

IEEE Transactions on Signal Processing
IEEE Transactions on Image Processing
IEEE Transactions on Circuits and Systems
IEEE Transactions on Circuits and Systems for Video Technology
IEEE Transactions on Pattern Analysis and Machine Intelligence
IEEE Transactions on Systems, Man, and Cybernetics
IEEE Transactions on Neural Networks
Signal Processing Letters
Computer Vision, Graphics, and Image Processing
Journal of the Optical Society of America
Journal of Mathematical Imaging and Vision
Applied Optics

Reviewer for the following textbook companies

Van Nostrand Reinhold, Electrical Engineering Division
McGraw-Hill, College/Schaum Division
MacMillan Publishing Company
Prentice Hall

List of Publications

Journal Articles

1. R. L. Stevenson and G. R. Arce, "Binary Display of Hexagonally Sampled Continuous-Tone Images," *Journal of the Optical Society of America A*, Vol. 2, pp. 1009-1013, July 1985.
2. G. R. Arce and R. L. Stevenson, "On the Synthesis of Median Filter Systems," *IEEE Transactions on Circuits and Systems*, Vol. CAS-34, No. 4, pp. 420-429, April 1987.
3. R. L. Stevenson and G. R. Arce, "Morphological Filters: Statistics and Further Syntactic Properties," *IEEE Transactions on Circuits and Systems*, Vol. CAS-34, No. 11, pp. 1292-1305, November 1987.
4. R. L. Stevenson and E. J. Delp, "Invariant Recovery of Curves in M-Dimensional Space from Sparse Data," *Journal of the Optical Society of America A*, Vol. 7, No. 3, pp. 480-490, March 1990.
5. R. L. Stevenson and E. J. Delp, "Viewpoint Invariant Recovery of Visual Surfaces from Sparse Data," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Vol. 14, No. 9, pp. 897-909, September 1992.
6. R. L. Stevenson and S. M. Schweitzer, "A Nonlinear Filtering Structure for Image Smoothing in Mixed Noise Environments," *Journal of Mathematical Imaging and Vision*, Vol. 2, No. 2/3, pp. 137-154, November 1992.

7. R. L. Stevenson, G. B. Adams, L. H. Jamieson and E. J. Delp, "Parallel Implementation for Iterative Image Restoration Algorithms on a Parallel DSP Machine," *Journal of VLSI Signal Processing*, Vol. 5, No. 2/3, pp. 261-272, April 1993.
8. R. L. Stevenson, B. E. Schmitz, and E. J. Delp, "Discontinuity Preserving Regularization of Inverse Visual Problems," *IEEE Transactions on Systems, Man and Cybernetics*, Vol. 24, No. 3, pp. 455-469, March 1994.
9. R. R. Schultz and R. L. Stevenson, "Improved Definition Image Expansion," *IEEE Transactions on Image Processing*, Vol. 3, No. 3, pp. 233-242, May 1994.
10. T. P. O'Rourke and R. L. Stevenson, "Human Visual System Based Wavelet Decomposition for Image Compression," *Journal of Visual Communications and Representation*, Vol. 6, No. 2, pp. 109-121, June 1995.
11. R. R. Schultz and R. L. Stevenson, "Stochastic Modeling and Estimation of Multispectral Image Data," *IEEE Transactions on Image Processing*, Vol. 4, No. 8, pp. 1109-1119, August 1995.
12. B. E. Schmitz and R. L. Stevenson, "Color Palette Restoration," *CVGIP: Graphical Models and Image Processing*, Vol. 57, No. 5, pp. 409-419, September 1995.
13. S. Choi, R. R. Schultz, R. L. Stevenson, Y. Huang, and R. Liu, "Contrast Enhancement of Missile Video Sequence via Image Stabilization and Product Correlation," *Optical Engineering*, Vol. 35, No. 12, pp. 3495-3507, December 1995.
14. T. P. O'Rourke and R. L. Stevenson, "Improved Image Decompression for Reduced Transform Coding Artifacts," *IEEE Transactions on Circuits and Systems for Video Technology*, Vol. 5, No. 6, pp. 490-499, December 1995.
15. R. R. Schultz and R. L. Stevenson, "Extraction of High-Resolution Frames from Video Sequences," *IEEE Transactions on Image Processing*, special issue on Nonlinear Image Processing, Vol. 5, No. 6, pp. 996-1011, June 1996.
16. R. L. Stevenson, "Inverse Halftoning via MAP Estimation," *IEEE Transactions on Image Processing*, Vol. 6, No. 4, pp. 574-583, April 1997.
17. B. E. Schmitz and R. L. Stevenson, "Enhancement of Sub-Sampled Color Image Data," *IEEE Transactions on Image Processing*, special issue on Color Image Processing, Vol. 6, No. 7, pp. 1052-1056, July 1997 (short paper).
18. R. R. Schultz, L. Meng, and R. L. Stevenson, "Subpixel Motion Estimation for Super-Resolution Image Sequence Enhancement," *Journal of Visual Communication and Image Representation*, special issue on High-Fidelity Media Processing, Vol. 9, No. 1, pp. 38-50, March 1998.
19. R. Llados-Bernaus and R. L. Stevenson, "Fixed Length Entropy Coding for Robust Video Compression," *IEEE Trans. on Circuits and Systems for Video Technology*, Vol. 8, No. 6, pp. 745-755, October 1998.

20. R. Lladós-Bernaus and R. L. Stevenson, "Edge Assisted Upper Band Coding Techniques", *International Journal of Imaging Systems and Technology*, Vol. 10, pp. 67-75, January 1999.
21. Z. Peng, Y.-F. Huang, D. J. Costello, Jr., and R. L. Stevenson, "A Pyramidal Image Coder Using Generalized Rank-Ordered Prediction Filter", *IEEE Trans. on Circuits & Systems for Video Technology*, Vol. 9, No. 4, pp. 540-544, June 1999 (short paper).
22. M. A. Robertson and R. L. Stevenson, "Reduced-Complexity Iterative Post-Filtering of Video," *IEEE Transactions on Circuits and Systems for Video Technology* Vol. 11, No. 10, pp. 1121-1128, October 2001.
23. M. A. Robertson and R. L. Stevenson, "Temporal Resolution Enhancement in Compressed Video Sequences," *EURASIP Journal on Applied Signal Processing*, Special Issue on Nonlinear Signal Processing, pp. 230-238, December 2001.
24. B. E. Marino and R. L. Stevenson, "Improving the Performance of Single Chip Image Capture Devices," *Journal of Electronic Imaging*, Vol. 12, No. 2, pp. 209-218, April 2003.
25. M. A. Robertson, S. Borman, and R. L. Stevenson, "Estimation-Theoretic Approach to Dynamic Range Improvement Through Multiple Exposures," *Journal of Electronic Imaging* Vol. 12, No. 2, pp. 219-228, April 2003.
26. R. Magill, C. E. Rohrs, and R. L. Stevenson, "Output-Queued Switch Emulation by Fabrics with Limited Memory," *IEEE Journal on Selected Areas in Communications*, Special Issue on High-Performance Electronic Switches/Routers for High-Speed Internet, Vol. 21, No. 4., pp. 606-615, May 2003.
27. M. A. Robertson and R. L. Stevenson, "DCT Quantization Noise in Compressed Images," *IEEE Transactions on Circuits and Systems for Video Technology*, Vol. 15, No. 1, pp. 27-38, January 2005.

Journal Articles Reprinted in Books

1. R. L. Stevenson and G. R. Arce, "Binary Display of Hexagonally Sampled Continuous-Tone Images," originally appeared as *Journal of the Optical Society of America A*, Vol. 2, pp. 1009-1013, July 1985, reprinted in *Selected Papers on Digital Halftoning*, SPIE Milestone Series, Vol. MS 154, J. Allebach, Ed., 1999.

Book Chapters

1. R. L. Stevenson and E. J. Delp, "Investigation into Building an Invariant Surface Model from Sparse Data," in *NATO ASI: Active Perception and Robot Vision*, A. Sood and H. Wechsler, Eds., Springer Verlag, pp. 539-558, 1992.
2. R. L. Stevenson and E. J. Delp, "Three-Dimensional Surface Reconstruction: Theory and Implementation," in *3D Object Recognition Systems*, A. K. Jain and P. J. Flynn, Eds., Elsevier, pp. 89-114, 1993.

3. D. L. Cohn and R. L. Stevenson, "Using Redundancy to Speed up Disk Arrays," in *Communications and Cryptography: Two Sides of One Tapestry*, R. E. Blahut, D. J. Costello, Jr., U. Maurer and T. Mittelholzer, Eds., Kluwer Academic Publishers, pp. 59-68, 1994.
4. R. Llados-Bernaus, M. Robertson and R. L. Stevenson, "A Stochastic technique for the removal of artifacts in compressed images and video", in *Signal Recovery Techniques for Image and Video Compression and Transmission*, A. K. Katsaggelos and N. P. Galatsanos, Eds., Kluwer Academic Publishers, 1998.
5. S. Borman and R. L. Stevenson, "Image Sequence Processing," in *Dekker Encyclopedia of Optical Engineering*, R. B. Johnson and R. G. Driggers, Eds., Marcel Dekker, Inc., 2003.
6. R. Schultz and R. L. Stevenson, "Bayesian Image and Video Enhancement Using a Non-Gaussian Prior," in *Nonlinear Signal and Image Processing: Theory, Methods, and Applications*, K. Barner and G. Arce, Eds., CRC Press, 2003.

Edited Conference Proceedings

1. S. A. Rajala and R. L. Stevenson, Eds., *Image and Video Processing II*, SPIE Proceedings Series, 1994.
2. R. L. Stevenson and S. A. Rajala, Eds., *Image and Video Processing III*, SPIE Proceedings Series, 1995.
3. R. L. Stevenson and M. I. Sezan, Eds., *Image and Video Processing IV*, SPIE Proceedings Series, 1996.
4. R. L. Stevenson, A. Drukarev, and T. R. Gardos, Eds., *Still Image Compression II*, SPIE Proceedings Series, 1996.
5. C.-S. Li, R. L. Stevenson, and L. Zhou, Eds., *Electronic Imaging and Multimedia Systems*, SPIE Proceedings Series, 1996.
6. R. L. Stevenson, Ed., *Proceeding of the Midwest Symposium on Circuits and Systems*, 1998.
7. K. Aizawa, R. L. Stevenson, and Y.-Q. Zhang, Eds., *Visual Communications and Image Processing '99*, SPIE Proceedings Series, 1999.
8. B. Vasudev, T. R. Hsing, A. G. Tescher, and R. L. Stevenson, Eds., *Image and Video Communications and Processing 2000*, SPIE Proceedings Series, 2000.
9. C. Bouman and R. L. Stevenson, Eds., *Computational Imaging 2003*, SPIE Proceedings Series, 2003.

Conference Papers

1. G. R. Arce and R. L. Stevenson, "On the Synthesis of Median Filter Systems," *Proceedings of the 1986 Princeton Conference on Information Sciences and Systems*, pp. 353-362, Princeton, New Jersey, March 1986.

2. R. L. Stevenson and G. R. Arce, "Theoretical Analysis of Morphological Filters," *Proceedings of the 24th Annual Allerton Conference on Communication, Control, and Computing*, pp. 353-362, Allerton, IL, October 1986.
3. R. L. Stevenson and E. J. Delp, "Investigation into Building an Invariant Surface Model from Sparse Data," *NATO ASI on Active Perception and Robot Vision*, Maratea, Italy, July 16-29, 1989.
4. R. L. Stevenson, "Machine Vision Systems for Component Assembly and Measurements," *Proceedings of the Fluid Power Technical Update Seminar*, pp. 98-107, West Lafayette, IN, August 2-4, 1989.
5. J. Song, R. L. Stevenson, and E. J. Delp, "The Use of Mathematical Morphology in Image Enhancement," *Proceedings of the 32nd Midwest Symposium on Circuits and Systems*, pp. 67-70, Urbana, IL, August 14-16, 1989.
6. R. L. Stevenson and E. J. Delp, "Invariant Reconstruction of Visual Surfaces," *Proceedings of the IEEE Workshop on the Interpretation of 3D Scenes*, pp. 131-137, Austin, TX, November 27-29, 1989.
7. R. L. Stevenson and E. J. Delp, "Fitting Curves with Discontinuities," *Proceedings of the IEEE International Workshop on Robust Computer Vision*, pp. 127-136, Seattle, WA, October 1-3, 1990.
8. R. L. Stevenson, G. B. Adams, L. H. Jamieson and E. J. Delp, "Three-Dimensional Surface Reconstruction on the AT&T Pixel Machine," *Proceedings of the 24th Annual Asilomar Conference on Signals, Systems and Computers*, pp. 544-548, Pacific Grove, CA, November 5-7, 1990.
9. R. L. Stevenson and E. J. Delp, "Invariant Reconstruction of 3D Curves and Surfaces," *Proceedings of the SPIE Conference on Intelligent Robots and Computer Vision*, pp. 364-375, Boston, MA, November 4-9, 1990.
10. R. L. Stevenson and E. J. Delp, "Viewpoint Invariant Recovery of Visual Surfaces from Sparse Data," *Proceedings of the Third International Conference on Computer Vision*, pp. 309-312, Osaka, Japan, December 4-7, 1990.
11. R. L. Stevenson and E. J. Delp, "Surface Reconstruction with Discontinuities," *Proceedings of the SPIE Conference on Curves and Surfaces in Computer Vision and Graphics II*, pp. 46-57, Boston, MA, November 10-15, 1991.
12. R. L. Stevenson, "A Nonlinear Estimation Technique for Filtering Images Corrupted with Gaussian Noise," *Proceedings of the SPIE/IS&T Conference on Nonlinear Image Processing III*, pp. 210-221, San Jose, California, February 9-14, 1992.
13. R. R. Schultz and R. L. Stevenson, "Improved Definition Image Expansion," *Proceedings of the 1992 International Conference on Acoustics, Speech and Signal Processing*, pp. III:173-176, San Francisco, California, March 23-26, 1992.
14. J. Wang, R. L. Stevenson, and Richard R. Schultz, "Recovery of Image Information from Halftone Information," *Proceedings of the Fifth Digital Signal Processing Workshop*, pp. 6.3.1-6.3.2, Starved Rock State Park, IL, September 13-16, 1992.

15. R. R. Schultz and R. L. Stevenson, "Parameter Estimation for Discontinuity-Preserving Stochastic Signal Models," *Proceedings of the Thirtieth Annual Allerton Conference on Communication, Control, and Computing*, pp. 319-328, Allerton, IL, September 30 - October 2, 1992.
16. S. M. Schweizer and R. L. Stevenson, "A Bayesian Approach to Inverse Halftoning," *Proceedings of the SPIE/IS&T Conference on Human Vision, Visual Processing and Digital Display IV*, pp. 282-292, San Jose, CA, January 31 - February 5, 1993.
17. R. L. Stevenson, "Reduction of Coding Artifacts in Transform Image Coding," *Proceedings of the 1993 International Conference on Acoustics, Speech and Signal Processing*, pp. V:401-404, Minneapolis, MN, April 27-30, 1993.
18. T. P. O'Rourke and R. Stevenson, "Human Visual System Based Subband Image Compression," *Proceedings of the Thirty-First Annual Allerton Conference on Communication, Control, and Computing*, pp. 452-461, Allerton, IL, September 29 - October 1, 1993.
19. B. E. Schmitz and R. L. Stevenson, "Parameter Estimation for the Curve Recovery Problem," *Proceedings of the Thirty-First Annual Allerton Conference on Communication, Control, and Computing*, pp. 485-494, Allerton, IL, September 29 - October 1, 1993.
20. T. P. O'Rourke and R. Stevenson, "Improved Image Decompression for Reduced Transform Coding Artifacts," *Proceedings of the SPIE/IS&T Conference on Image and Video Processing, II*, pp. 90-101, San Jose, CA, February 6-10, 1994.
21. R. R. Schultz, S. Choi, R. L. Stevenson, Y. Huang, R. Liu and L. Morine, "Contrast Enhancement of Missile Data Through Image Sequence Stabilization and Product Correlation," *Proceedings of the SPIE/IS&T Conference on Image and Video Processing, II*, pp. 164-175, San Jose, CA, February 6-10, 1994.
22. B. E. Schmitz and R. L. Stevenson, "Color Palette Restoration," *Proceedings of the SPIE/IS&T Conference on Human Vision, Visual Processing and Digital Display, V*, pp. 327-338, San Jose, CA, February 6-10, 1994.
23. R. R. Schultz, H. M. Zayed, R. L. Stevenson, R. J. Minniti and G. H. Bernstein, "ASIC Design for Robust Signal and Image Processing," *Proceedings of the Fourth Great Lakes Symposium on VLSI*, pp. 138-143, Notre Dame, IN, March 4-5, 1994.
24. R. R. Schultz and R. L. Stevenson, "Stochastic Modeling and Estimation of Multispectral Image Data," *Proceedings of the 1994 International Conference on Acoustics, Speech and Signal Processing*, pp. V:373-376, Adelaide, Australia, April 19-22, 1994.
25. R. R. Schultz and R. L. Stevenson, "A Window-Based Bayesian Estimator for Noise Removal," *Proceedings of the 37th Midwest Symposium on Circuits and Systems*, pp. 860-863, Lafayette, LA, August 3-5, 1994.

26. R. R. Schultz, R. L. Stevenson, and A. Lumsdaine, "Maximum Likelihood Parameter Estimation for Non-Gaussian Prior Signal Models," *Proceedings of the 1994 IEEE International Conference on Image Processing*, pp. II:700-704, Austin, TX, November 13-16, 1994.
27. R. R. Schultz and R. L. Stevenson, "Video Resolution Enhancement," *Proceeding of the SPIE/IS&T Conference on Image and Video Processing, III*, pp. 23-34, San Jose, CA, February 5-10, 1995.
28. J. Squyres, A. Lumsdaine, and R. L. Stevenson, "Cluster-Base Image Processing," *Proceedings of the SPIE/IS&T Conference on Image and Video Processing, III*, pp. 228-239, San Jose, CA, February 5-10, 1995.
29. R. R. Schultz and R. L. Stevenson, "Improved Definition Video Frame Enhancement," *Proceedings of The 1995 IEEE International Conference on Acoustics, Speech and Signal Processing*, pp. 2169-2172, Detroit, MI, May 9-12, 1995.
30. T. P. O'Rourke, R. L. Stevenson, L. Perez, D. J. Costello, Jr., and Y.-F. Huang, "Robust Transmission of Compressed Images over Noisy Gaussian Channels," *Proceedings of The 1995 IEEE International Conference on Acoustics, Speech and Signal Processing*, pp. 2319-2322, Detroit, MI, May 9-12, 1995.
31. R. L. Stevenson and R. R. Schultz (invited), "Extraction of High-Resolution Frames from Video Sequences," *IEEE Workshop on Nonlinear Image Processing*, pp. 718-721, Greece, June 20-22, 1995.
32. J. Squyres, A. Lumsdaine, and R. L. Stevenson, "A Parallel Image Processing Toolkit Using MPI," *Proceedings the MPI Developers Conference*, <http://www.cse.nd.edu/mpidc95/>, Notre Dame, IN, June 22-23, 1995.
33. R. L. Stevenson, "Reduction of Coding Artifacts in Low-Bit-Rate Video Coding," *Proceedings of the 1995 Midwest Symposium on Circuits and Systems*, pp. 854-857, Rio de Janeiro, Brazil, August 1995.
34. B. E. Schmitz and R. L. Stevenson, "Color Space Expansion," *Proceedings of the 1995 Midwest Symposium on Circuits and Systems*, pp. 133-136, Rio de Janeiro, Brazil, August 1995.
35. T. P. O'Rourke, R. L. Stevenson, D. J. Costello, Jr. and Y.-F. Huang, "Improved Decoding of Compressed Images Received over Noisy Channels," *Proceedings of the 1995 IEEE International Conference on Image Processing*, pp. II:65-68, Washington, DC, October 1995.
36. R. R. Schultz and R. L. Stevenson, "Motion Compensated Scan Conversion of Interlaced Video Sequences," *Proceedings of the SPIE/IS&T Conference on Image and Video Processing IV*, pp. 107-118, San Jose, CA, February 1996.
37. B. E. Schmitz and R. L. Stevenson, "Enhancement of Sub-Sampled Color Image Data," *Proceedings of the SPIE/IS&T Conference on Image and Video Processing IV*, pp. 97-106, San Jose, CA, February 1996.

38. T. P. O'Rourke, and R. L. Stevenson, "Vector Quantization with Distance Constraints for Enhanced Post-Processing," *Proceedings of the SPIE/IS&T Conference on Still Video Compression II*, pp. 9–20, San Jose, CA, February 1996.
39. J. M. Squyres, A. Lumsdaine, B. C. McCandless, and R. L. Stevenson, "Parallel and Distributed Algorithms for High Speed Image Processing," *Proceedings of the Sixth Annual Dual-Use Technologies & Applications Conference*, pp. 185–190, Syracuse, NY, June 1996.
40. J. Brockman, S. Batill, J. Renaud, J. Kantor, D. Kirkner, P. Kogge, and R. L. Stevenson, "Development of a Multidisciplinary Engineering Design Laboratory at the University of Notre Dame," *Proceedings of the ASEE Annual Conference*, Washington, D.C., June 1996.
41. R. R. Schultz and R. L. Stevenson, "Sub-Pixel Motion Estimation," *Proceedings of the 1996 Midwest Symposium on Circuits and Systems*, pp. 1385–1388, Ames, Iowa, August 1996.
42. R. Llados-Bernaus and R. L. Stevenson, "Reduction of Coding Artifacts in Video Compression," *Proceedings of the SPIE Internal Conference on Electronic Imaging and Signal Processing*, pp. 2–10, Beijing, China, November 1996.
43. R. Llados-Bernaus and R. L. Stevenson, "A Robust Low-Bit Rate 3D Subband Codec," *Proceedings of the SPIE Internal Conference on Visual Communications and Image Processing*, pp. 610–621, San Jose, CA, February 1997.
44. R. R. Schultz, L. Meng, and R. L. Stevenson, "Subpixel Motion Estimation for Multiframe Resolution Enhancement," *Proceedings of the SPIE Internal Conference on Visual Communications and Image Processing*, pp. 1317–1328, San Jose, CA, February 1997.
45. M. J. Wahoske, R. W. Liu, and R. L. Stevenson, "Dual-Receiver Blind Identification for Image Blurs," *Proceedings of the 1997 IEEE International Conference on Circuit and Systems*, vol. 2, pp. 1377–1380, Hong Kong, June 1997.
46. R. Llados-Bernaus and R. L. Stevenson, "Addition of Robustness to Standard Video Compression Protocols", *Proceedings of the IEEE Midwest Symposium on Circuits and Systems*, pp. 921–924, Sacramento, CA, August 1997.
47. R. Llados-Bernaus and R. L. Stevenson, "Fixed Length Entropy Coding for Robust Video Compression", *Proceedings of the IEEE International Conference on Image Processing*, Vol. II, pp. 97–100, Santa Barbara, CA, October 1997.
48. R. Schultz and R. L. Stevenson, "Bayesian Estimation of Subpixel-Resolution Motion Fields and High-Resolution Video Stills," *Proceedings of the IEEE International Conference on Image Processing*, Vol. III, pp. 62–65, Santa Barbara, CA, October 1997.
49. J. He, D. Costello, Y. F. Huang, and R. L. Stevenson, "On the Application of Turbo Codes to the Robust Transmission of Compressed Images," To appear at the *Proceedings of the IEEE International Conference on Image Processing*, Vol. III, pp. 559–562, Santa Barbara, CA, October 1997.

50. Z. Peng, Y. F. Huang, D. Costello, and R. L. Stevenson, "Image Compression using Region-Activity-Based Pyramidal Coding and Iterative Vector Quantizer," *Proceedings of the IEEE International Conference on Image Processing*, Vol. III, pp.698-701, Santa Barbara, CA, October 1997.
51. R. Lladós-Bernaus and R. L. Stevenson, "Edge-Assisted Upper Bands Coding Techniques", *Proceedings of the SPIE International Conference on Visual Communications and Image Processing*, pp. 2-13, San Jose, CA, January 1998.
52. Z. Peng, Y. F. Huang, D. Costello, and R. L. Stevenson, "Joint Source/Channel Decoding for Image Transmission - A Turbo Code Approach," *Proceedings of the Conference on Information Sciences and Systems*, pp. 330-335, Princeton, NJ, March 1998.
53. R. Lladós-Bernaus and R. L. Stevenson, "Codeword Assignment for Fixed-Length Entropy Coded Video Streams", *IEEE Data Compression Conference*, pp. 269-275, Snowbird, UT, March 1998.
54. Z. Peng, Y. F. Huang, D. Costello, and R. L. Stevenson, "Joint Channel and Source Decoding for Vector Quantized Images using Turbo Codes," *Proceedings of the IEEE International Symposium on Circuits and Systems*, pp. IV:5-8, Monterey, CA, May 1998.
55. R. Lladós-Bernaus and R. L. Stevenson, "Bidirectional Block Placement in Corrupted Fixed-Length Entropy Coded Video Streams", *Proceedings of the IEEE Midwest Symposium on Circuits and Systems*, pp. 391-394, Notre Dame, IN, August 1998.
56. M. Robertson and R. L. Stevenson, "Reducing the Complexity of Iterative Post-Processing of Video," *Proceedings of the IEEE Midwest Symposium on Circuits and Systems*, pp. 399-402, Notre Dame, IN, August 1998.
57. S. Borman and R. L. Stevenson, "Super-Resolution Still from Image Sequences - A Review," *Proceedings of the IEEE Midwest Symposium on Circuits and Systems*, pp. 374-378, Notre Dame, IN, August 1998.
58. Z. Peng, Y. F. Huang, D. Costello, and R. L. Stevenson, "Joint Decoding for Turbo Codes for Subband Coded Image," *Proceedings of the IEEE International Conference on Image Processing*, pp. I:329-333, Chicago, IL, October 1998.
59. M. Robertson and R. L. Stevenson, "Reducing the Complexity of a MAP Post-Processing Algorithm for Video Sequences," *Proceedings of the IEEE International Conference on Image Processing*, pp. I:372-376, Chicago, IL, October 1998.
60. Z. Peng, Y. F. Huang, D. Costello, and R. L. Stevenson, "On the Tradeoff Between Source and Channel Coding Rates for Image Transmission," *Proceedings of the IEEE International Conference on Image Processing*, pp. II:118-121, Chicago, IL, October 1998.

61. R. Lladós-Bernaus and R. L. Stevenson, "Computationally Efficient Fixed-Length Entropy Codec for Robust Video Compress," *Proceedings of the IEEE International Conference on Image Processing*, pp. III:85–89, Chicago, IL, October 1998.
62. S. Borman, M. Robertson, and R. L. Stevenson, "Block-Matching Sub-Pixel Motion Estimation from Noisy Under-Sampled Frames – An Empirical Performance Evaluation," *Proceedings of Visual Communication and Image Processing '99*, SPIE Proceedings Vol. 3653, pp. 1442–1451, January 25–27, 1999.
63. M. A. Robertson, S. Borman, and R. L. Stevenson, "Dynamic Range Improvement Through Multiple Exposures," *Proceedings of the International Conference on Image Processing*, pp. III:159–163, Kobe, Japan, October 1999.
64. S. Borman and R. L. Stevenson, "Simultaneous Multi-frame MAP Super-Resolution Video Enhancement using Spatio-temporal Priors", *Proceedings of the International Conference on Image Processing*, pp. III:469–473, Kobe, Japan, October 1999.
65. M. A. Robertson and R. L. Stevenson, "Restoration of Compressed Video using Temporal Information," *SPIE Visual Communications and Image Processing 2001*, pp. 21–29, San Jose, CA, January 2001.
66. M. A. Robertson and R. L. Stevenson, "Temporal Resolution Enhancement in Compressed Video," *Nonlinear Signal and Image Processing 2001*, Baltimore, MD, June 2001.
67. M. A. Robertson and R. L. Stevenson, "DCT Quantization Noise in Compressed Images," *Proceedings of the International Conference on Image Processing 2001*, Thessaloniki, Greece October, 2001.
68. K. Erickson and R. L. Stevenson, "Frame Type Selection for Off-Line MPEG Encoding," *Proceedings of SPIE Visual Communications and Image Processing 2001*, San Jose, CA, January 2002.
69. R. Magill, C. E. Rohrs, and R. L. Stevenson, "Revisiting Output Queued Switch Emulation by a Combined Input/Output Queued Switch," *Proceedings of the Fortieth Annual Allerton Conference on Communication, Control, and Computing*, Allerton, IL, October 2 – 4, 2002.
70. R. Magill, C. E. Rohrs, and R. L. Stevenson, "Output Queued Switch Emulation by a Buffered Crossbar Fabric," *Proceedings of the Fortieth Annual Allerton Conference on Communication, Control, and Computing*, Allerton, IL, October 2 – 4, 2002.
71. S. Borman and R. L. Stevenson, "Image resampling and constraint formulation for multi-frame super-resolution restoration," *Proceedings of the SPIE Conference on Computational Imaging*, Santa Clara, CA, January 20 – 24, 2003.
72. G. Zhang and R. L. Stevenson, "A Modified Fixed-Length Entropy Coding Algorithm for Robust Video Compression," *Proceedings of the SPIE Conference on Image and Video Communications and Processing 2003*, Santa Clara, CA, January 20 – 24, 2003.

73. S. Borman and R. L. Stevenson, "Linear models for multi-frame super-resolution restoration under non-affine registration and spatially varying PSF," to appear in *Proceedings of the SPIE Conference on Computational Imaging*, San Jose, CA, January 18 – 22, 2004.
74. G. Zhang and R. L. Stevenson, "Error Resilient Video Coding Using Virtual Reference Picture." *Proceedings of the SPIE Conference on Image and Video Communications and Processing 2005*, San Jose, CA, January 18-20, 2005.
75. G. Zhang, R. L. Stevenson, "Hybrid Scalable Video Coding with Multiple Description and Layered Coding," *Proceedings of the SPIE Conference on Visual Communications and Image Processing 2006*, San Jose, Jan 2006.
76. Y. Li, R. L. Stevenson, J. Gai, "Detection of Junction in Images," *Proceeding of the SPIE Conference on Image Processing: Algorithms and Systems V*, San Jose, CA, Feb 2007.
77. Y. Li, R. L. Stevenson, "Multimodal Image Registration Based on Edges and Junctions." *Proceeding of the SPIE Conference on Visual Communications and Image Processing 2007*, San Jose, Jan 2007.
78. J. Gai, R. L. Stevenson, A robustified hidden Markov model for visual tracking with subspace representation *Proceeding of the SPIE Conference on Visual Communications and Image Processing 2007*, San Jose, Jan 2007.

Papers at Undergraduate Research Conferences

1. S. M. Schweizer and R. L. Stevenson, "Predetection of Impulse Locations in a Mixed Noise Environment," *Proceedings of the Third Annual Argonne Symposium for Undergraduates in Science, Engineering and Mathematics*, p. 73, Argonne National Laboratory, Argonne, IL, November 6–7, 1992.
2. M. A. Lexa and R. Stevenson, "Filtering Video Sequences using Nonlinear Techniques," *Proceedings of the Fourth Annual Argonne Symposium for Undergraduates in Science, Engineering and Mathematics*, p. 83, Argonne National Laboratory, Argonne, IL, November 5–6, 1993.
3. M. P. Witzman, R. R. Schultz and R. Stevenson, "Computation of MAP Signal Estimates using a Gradient Descent Window Operator," *Proceedings of the Fourth Annual Argonne Symposium for Undergraduates in Science, Engineering and Mathematics*, p. 84, Argonne National Laboratory, Argonne, IL, November 5–6, 1993.
4. T. L. Piatt and R. L. Stevenson, "The Use of Block-Matching Motion Estimation in Image Filtering," appeared at the *National Conference on Undergraduate Research*, Western Michigan University, Kalamazoo, MI, April 14-16, 1994.
5. M. P. Witzman, R. R. Schultz and R. L. Stevenson, "Computation of Partial Signal MAP Estimates," appeared at the *National Conference on Undergraduate Research*, Western Michigan University, Kalamazoo, MI, April 14-16, 1994.

Patents

1. "Video Coding using a Maximum A Posteriori Loop Filter," U.S. Patent 6,081,552, June 27, 2000.

Invited Talks

1. "Bayesian Techniques for Image Restoration," Department of Electrical Engineering and Computer Science, Washington State University, Pullman, WA, March 27, 1992.
2. "Reconstruction and Enhancement of Image and Video Data," Hewlett Packard Research Laboratory, Palo Alto, CA, October 12, 1993.
3. "Stochastic Image Modeling for Image Enhancement," Department of Electrical Engineering and Computer Science, University of California, Berkeley, CA, February 10, 1994.
4. "Stochastic Image Modeling for Image Enhancement," Department of Electrical Engineering and Computer Science, Northwestern University, IL, May 31, 1994.
5. "Bayesian Estimation Techniques for Image/Video Processing," Intel Corp., Hillsboro, OR, Part I July 7, 1994, Part II July 21, 1994.
6. "HVS Based Image Compression," Intel Corp., Hillsboro, OR, August 18, 1994.
7. "Bayesian Estimation Techniques for Image/Video Processing," Tektronix Inc., Beaverton, OR, August 19, 1994.
8. "Bayesian Estimation Techniques for Image/Video Processing," Intel Corp., Santa Clara, CA, August 23, 1994.
9. "Post-Processing MRV Video Data," Intel Corp., Hillsboro, OR, August 25, 1994.
10. "Improved Robust Image/Video Communication," Motorola Corp., Schaumburg, IL, February 21, 1995.
11. "Stochastic Modeling of Color Image Data," Xerox Corp., Webster, NY, May 24, 1995.
12. "Multi-Frame Integration for Video Enhancement," Kodak Corp., Rochester, NY, August 4, 1995.
13. "Bayesian Estimation Techniques for Image/Video Processing," Ricoh California Research Center, Palo Alto, CA, February 3, 1996.
14. "Bayesian Estimation Techniques for Image/Video Processing," University of Delaware, Newark, DE, October 10, 1996.
15. "Issues in Video Compression," Intel Corporation, Hillsboro, OR, June 21, 1997.
16. "Techniques for High-Speed Image Enhancement," Sun Microsystems, Sunnyvale, CA, May 21, 1998.

17. "Stochastic Modeling for Image/Video Processing," Purdue University, West Lafayette, IN, Nov. 12, 1998.
18. "High Performance Multimedia Applications Reserach," Sun Microsystems, Sunnyvale, CA, Jan. 25, 1999.
19. "Video over the Internet," D. E. Shaw & Co., New York, NY, May 4, 2000.
20. "Entertainment Video over the Internet," Sun Microsystems, Sunnyvale, CA, Nov. 16, 2000.
21. "The Creative Scientist," Keynote address at 16th Annual Undergraduate Research Symposium, University of Delaware, Newark, DE, May 5, 2001.
22. "Super-Resolution Camera Systems," Thomson Consumer Electronics, Indianapolis, IN, November 28, 2001.
23. "Three-Dimensional Signal Processing," Air Force Research Laboratory, Rome, New York, September 26, 2002.
24. "Bayesian Image and Video Restoration," ECE Distinguished Speaker Seminar Series at the Illinois Institute of Technology, October 24, 2003.
25. "Error Resilient Video Coding," Purdue University, West Lafayette, IN, May 17, 2005.
26. "Robust Video CompressionffUsing ffMultiple Description Coding," Indiana University-Purdue University Indianapolis, Indianapolis, IN, November 2, 2006.

Dissertations/Theses Supervised

Ph.D. Dissertations

1. R. R. Schultz, "Multichannel Stochastic Image Models: Theory, Applications, and Implementations," Ph.D. Dissertation, University of Notre Dame, November 1994.
2. T. P. O'Rourke, "Robust Image Communication: An Improved Design," Ph.D. Dissertation, University of Notre Dame, January 1996.
3. B. E. Schmitz, "Enhancement of Sub-Sampled Color Image Data," Ph.D. Dissertation, University of Notre Dame, March 1996.
4. R. Lladós-Bernaus, "Entropy Coding Techniques for Robust Video Compression," Ph.D. Dissertation, University of Notre Dame, March 1998.
5. M. A. Robertson, "High-Quality Reconstruction of Digital Image and Video from Imperfect Observations," Ph.D. Dissertation, University of Notre Dame, April 2001.
6. R. Magill, "Emulating an Output Queued Packet Switch with Systems Containing Input and Output Queueing," Ph.D. Dissertation, University of Notre Dame, May 2003.

7. K. Erickson, "Quality Optimization of Standards - Compliant Encoded Video," Ph.D. Dissertation, University of Notre Dame, May 2003.
8. S. Borman, "Topics in Multiframe Superresolution Restoration," Ph.D. Dissertation, University of Notre Dame, May 2004.
9. G. Zhang, "Robust Scalable Video Compression Using Multiple Description Coding," Ph.D. Dissertation, University of Notre Dame, May 2007.

Placement of Ph.D. Students

1. R. R. Schultz, Associate Professor with Tenture, Department of Electrical Engineering, University of North Dakota, Grand Forks, North Dakota.
2. T. P. O'Rourke, Senior Research Engineer, Intel Corporation, Hillsboro, Oregon.
3. B. E. Schmitz, Chair and Associate Professor with Tenture, Department of Electrical and Computer Science, Loyola Marymount University, Los Angeles, California.
4. R. Lladós-Bernaus, McKinsey & Company, Madrid, Spain.
5. M. A. Robertson, Information Directorate of the Air Force Research Laboratory, Rome, New York.
6. R. Magill, National Security Agency, Washington, DC.
7. S. Borman, Sun Microsystems, Santa Clara, CA.
8. G. Zhang, FastVDO, Columbia, MD.

M.S.E.E Theses

1. R. R. Schultz, "Improved Definition Image Expansion," M.S.E.E. Thesis, University of Notre Dame, January 1992.
2. T. P. O'Rourke, "Human Visual Based Wavelet Decomposition for Image Compression," M.S.E.E. Thesis, University of Notre Dame, December 1992.
3. B. E. Schmitz, "Curve Reconstruction: A Balance Between Smoothness and Discontinuity Preservation," M.S.E.E. Thesis, University of Notre Dame, February 1993.
4. H. M. Zayed, "A Tunable Analog VLSI Network for Preserving Discontinuities in One-Dimensional Signals," M.S.E.E Thesis, University of Notre Dame, November 1993 (co-adviser: G. Bernstein).
5. M. J. Wahoske, "Dual-Receiver Blind Identification for Image Blurs," M.S.E.E Thesis, University of Notre Dame, August 1996 (co-adviser: R. Liu).
6. M. Robertson, "Computationally Efficient Post-Processing of Compressed Video Streams," M.S.E.E Thesis, University of Notre Dame, February 1998.

7. G. Zhang, "Modified Fixed-Length Entropy Coding for Robust Video Compression," M.S.E.E Thesis, University of Notre Dame, December 2002.

Current Research Students

Yong Li (Ph.D. expected May 2007)
Jiading Gai (Ph.D. expected May 2007)

Courses Taught

EE220 – Devices and Systems in Electrical Engineering (Fall 1998, 1999, 2000)
EE224 – Introduction to Electrical Networks (Fall 1990, 1992, 1995, 1999, 2000, 2006)
EE242 – Electronic Circuits (Spring 2001, 2002, 2003, 2004, 2005)
EE471 – Digital Signal Processing (Spring 1992, 1993, 1995, 1996, 2000)
EE498F – Topics in Image Processing (Fall 1994)
EE573 – Random Processing, Estimation and Detection Theory (Spring 2007)
EE581 – Digital Image Processing (Spring 1991, 1994, 1999, 2006, Fall 1997, 2001, 2003)
EE598D – Advanced Digital Signal Processing (Fall 2004, 2005)
EE598J – Computer Vision (Fall 1991, 1993)
EE663 – Advanced Stochastic Processes (Spring 1998, Fall 2002)
ELEG631 – Applications of Digital Signal Processing (Fall 1996, Univ. of Delaware)

Courses Developed

EE220 – Devices and Systems in Electrical Engineering
EG498A – Multidisciplinary Engineering Design Laboratory
EE663 – Advanced Stochastic Processes
EE598D – Advanced Digital Signal Processing
EE598J – Computer Vision
ELEG631 – Applications of Digital Signal Processing

Grants Received

From External Sponsors

1. co-PI, Rome Laboratory, F30602-92-C-0138, \$85,000 for "Multi-Frame Integration," 8/92–8/93 (with Y. Huang and R. Liu).
2. co-PI, National Science Foundation, CDA92-22905, \$58,126 for a "High Resolution Video Processing System," 1/93–12/95 (with D. Costello, K. Sauer, P. Bauer, Y. Huang and R. Liu).
3. PI, Apple Computer, Inc., \$15,000 for "Color Palette Restoration," 6/93–6/94, \$16,467 equipment donation.

4. co-PI, National Aeronautics and Space Administration, NASA-NAG 3-1549, \$50,795 for "Integrated System Design for the Transmission of Image Data over Low Bit Rate Noisy Channels," 1/94-12/94 (with D. Costello and Y. Huang).
5. PI, Rome Laboratory, F30602-94-1-0017, \$35,408 for "Multi-Frame Integration for the Extraction of High Resolution Still Images from Video Sequences," 9/94-9/95.
6. PI, Rome Laboratory, F30602-94-1-0016, \$50,785 for "Parallel and Distributed Algorithms for High-Speed Image Processing," 9/94-9/95 (with A. Lumsdaine).
7. PI, Intel Corp., \$68,000 for "Post-Processing Compressed Video Data," 9/94-12/98, \$15,000 equipment donation.
8. co-PI, Lockheed Martin, \$150,000 for "Robust Transmission of Images over Noisy Channels," 3/95-12/96 (with D. Costello and Y. Huang).
9. PI, Apple Computer, Inc., \$19,100 for "Quicktake Image Enhancement," 6/95-6/96, \$15,000 equipment donation.
10. PI, Motorola Corp., \$91,252 for "Robust Transmission of Image Data over Low-Bit-Rate Noisy Channels," 9/95-8/98 (with D. Costello, R. Liu and Y. Huang).
11. PI, Rome Laboratory, F30602-96-C-0235, \$199,964 for "Parallel and Distributed Algorithms for High-Speed Image Processing," 7/96-1/98 (with A. Lumsdaine).
12. PI, Sun Microsystems, \$21,400 for "VIS-Based Image Enhancement," 6/97-7/98.
13. co-PI, IBM, \$309,544 for "Scalable Shared Memory: Case Studies," 1/1/98-12/31/00, (with A. Lumsdaine, N. Chrisochoides, J. Westerink, E. Maginn, M. Stadtherr).
14. co-PI, Army Research Office, DAAG55-98-1-0091, \$250,000 for "Scalable Meta-Computing for Computational Science and Engineering," 3/2/98-3/1/99, (with A. Lumsdaine, N. Chrisochoides, J. Westerink, E. Maginn, M. Stadtherr).
15. PI, Department of Defense, MDA904-98-C-B224, \$124,150 for "Temporal Image Enhancement," 3/11/98-3/10/99 (with A. Lumsdaine).
16. PI, Sun Microsystems, \$55,060 for "Multimedia Architectures," 9/1/99-9/1/00.
17. co-PI, Indiana's 21st Century Research & Technology Fund, \$829,714 for "Entertainment Video over the Internet," 9/1/00-8/31/02 (with E. Delp, B. Beyers, C. Rosenberg, P. Salama, and N. Shroff).
18. PI, Sun Microsystems, \$40,000 for "Entertainment Video," 2/1/01-1/31/02.
19. co-PI, National Science Foundation, \$248,887 for "Instrumentation for Multidimensional Imaging and Applications", 2001-2004 (P. Flynn, K. Bowyer, and D.Z. Chen).

20. co-PI, Indiana's 21st Century Research & Technology Fund, \$856,576 for "Advanced Digital Video Compression: New Techniques for Security Applications," 5/04-5/06 (with E. Delp, L. Chrisopher, B. Brenner, C. Armstrong, and P. Salama).
21. PI, Department of the Air Force, \$75,000 for "Multi-Source Image Correlation and Analysis," 5/1/04-12/31/04 (with P. Flynn, and K. Bowyer).

From Internal Sponsors

1. PI, Jesse H. Jones Faculty Research Fund, University of Notre Dame, \$9,750 for "Reliable Surface Parameter Estimation in Three-Dimensional Vision," 9/91-5/92 (with P. Flynn).
2. PI, Jesse H. Jones Faculty Research Equipment Fund, University of Notre Dame, \$7,675 for "Hardware for the Acquisition and Display of Real-Time Video Signals," 3/92 (with K. Sauer).
3. PI, Indiana Space Grant Consortium, \$7,300 for "Real-Time Vision for Teleoperated Control of Unmanned Vehicles and Robots," 5/92-8/92; \$7,500 for "Robust Video Coding," 5/93-8/93; \$5,889 for "Robust Video Coding," 5/94-8/94.
4. co-PI, Office of University Computing, University of Notre Dame, \$20,000 for "Computing for System Engineering," 7/93-6/94 (with D. Costello and A. Lumsdaine).
5. co-PI, Office of University Computing, University of Notre Dame, \$21,600 for "Multidisciplinary Engineering Design Laboratory," 7/95-6/96 (with J. Brockman, J. Kantor, J. Renaud, D. Kirkner, S. Batill, and P. Kogge).
6. co-PI, Office of University Computing, University of Notre Dame, \$23,000 for "An ATM Network for High-Speed Communications," 7/96-6/97 (with A. Lumsdaine).
7. PI, Graduate School, University of Notre Dame, \$71,980 for "High-Resolution Video Processing,".
8. co-PI, Graduate School, University of Notre Dame, \$215,000 for "Scalable Meta-Computing for High Performance Computational Science and Engineering," (with A. Lumsdaine, N. Chrisochoides, J. Westerink, E. Maginn, M. Stadtherr).
9. PI, Graduate School, University of Notre Dame, \$75,000 for "Sun Microsystems Embedded Center."

University Services

University

Intellectual Property Committee, 2003–2006
ND's Technical Liaison to the Indiana Governor for Sun Microsystems, 2000–2001
Committee on Technical Computing, 1995–1996
Univ. Committee on Computer and Information Sciences, 1995–1996, 2002–2003
University Committee on Academic Technology, 2003–Present
Faculty Senate, 1993–1996
Freshman Orientation, 1993–1995, 1998–Present

Engineering College

Four Horsemen venture capital fund advisory committee, 2003–2004
CSE Chairman Search Committee, 1999–2001
College Council, 1997–2000
Undergraduate Studies Committee, 1994–1996, 1998–1999
College Computer Committee, 1995–1996, 1997–Present
Ad hoc College Computer Committee, 2001–2002, 2007
Friends of the MEP mentoring initiative, 1992

Electrical Engineering Department

Electrical Engineering Commencement Coordinator, 2002
Area Committee Chairman, 2002–Present
Graduate Committee, 1991–1994, 2003–2005
Undergraduate Committee, 1994–1996, 1998–2000, 2001–2003, 2005–2007
Undergraduate Coordinator, 1994–1996, 1998–1999
Qualifying Exam Coordinator, 1991–1993
Computer Committee, chair, 1994–1996, 1997–Present
Commencement Service Coordinator, 2002
Graduate Admissions Committee, 1997–1998
Facilities Committee, 1997–1998
Honesty Committee, 1993–1994
Eta Kappa Nu Faculty Advisor, 1991–1996

Exhibit B

**REDACTED
IN ITS ENTIRETY**